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This report contains information on national-level science policies, technology strategies, and research and development programs in West European science and technology in general and specifically in civil technology, with particular attention to transportation, energy, chemical manufacturing, industrial automation and technology transfer. The report will focus primarily on France and the Federal Republic of Germany, but will also cover important developments in Italy, the Netherlands, Sweden and other West European countries.

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WEST EUROPE REPORT

SCIENCE AND TECHNOLOGY

No. 86

CONTENTS

TRANSPORTATION

BRIEFS

PROTEIN FROM MICROORGANISMS--The industrial production of protein, the result of West German technology, may become an export commodity. A process development project in this area has now come to a successful conclusion. At present, 300 to 400 tons of protein-rich fodder is being produced at a pilot plant in Frankfurt. The process involves microorganisms capable of breaking down paraffin, alcohol, or cellulose. Methods for the mass production of microorganisms were also developed as part of the project. In addition to protein for fodder, fats, phospholipids, and nucleic acid derivatives can be extracted by a new method for the nondestructive separation of cell materials. In this way, it is hoped that biomass can be refined and used for food production. Several countries are reported to be interested in equipment for protein production. The process will be tested in Egypt with an already completed mobile unit. Agricultural waste will serve as the base material for the production of protein for fodder. A number of companies and research institutes participated in developing the protein technology. The West German Research Ministry supported the project with about 100 million kronor. [Text] [Stockholm KEMISK TIDSKRIFT in Swedish Sep 81 p 21] 9336

CSO: 3102/72

SIEMENS USES GATE ARRAYS IN DISPLAY TERMINAL

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 5 Nov 81 p 7

[Text] Valvo reports that for the first time gate arrays from Valvo and Siemens are being used in the Siemens 9750 data display terminal in place of conventional integrated circuits. The gate arrays assume the function of the central control unit and command of the peripheral instruments. One flat Euroformat subassembly, equipped with about 30 standard TTL [transistor-transistor logic] modules (SSI [small-scale integration] and MSI [medium-scale integration] is combined in a gate array with 40 connector pins. This circuit contains between 600 and 1,200 gate functions. According to Valvo, gate arrays offer considerable advantages, such as longer life, smaller volume and lower weight, less loss of performance, quicker and more error-free assembly of the equipment, the use of the most recent technology and expansion of functions with the same volume.

The previous discrete solution was redesigned in conjunction with the gate array manufacturers. By using existing CAD [computer access device] aids, from logic simulation and emulator comparison to mask control, short realization times can be achieved; Valvo believes that cost-intensive and time-consuming redesigns can be avoided.

Gate arrays consist of between 12,00 and 1,600 gates, arranged in a matrice, and 36 TTL-compatible in- and out-circuits on one chip. They provide a link with the outside world. The desired logic circuits are linked to each other through two-position wiring and tested with a layout check program for agreement with the original schematic diagram.

In Valvo's opinion, gate arrays will be used everywhere in future where a logical design cannot be solved optimally by using software, where an appropriate standard circuit is not available and when an integrated circuit developed specially for the case at hand is not economical because of low production numbers. In the final manufacturing steps the gate array will be tailored specifically for the customer, but it offers the price advantages of mass production and the technical advantages of high integration density, such as high speed, low loss of performance and a high degree of reliability.

9581
CSO: 3102/51

CNET FACILITY TO INDUSTRIALIZE MICROELECTRONICS ADVANCES

Paris ELECTRONIQUE ACTUALITES in French 6 Nov 81 pp 1, 13

[Article by F. Grosvalet: "1.5 micron CMOS Technology Ready to be Industrialized"]

[Text] Grenoble--Eight months after its official inauguration, the Norbert Segart Center (CNS) of CNET is in operation; its programs are oriented toward research and development of MOS VLSI circuits, with the aim of transferring its know-how to industrial users. It now has a pilot line equipped with industrial-type machines (ion implantation, plasma etch, 1/1 photoprojection lithography with automatic alignment, contact masking, electronic masking, PCVD and other film deposition, and so on), which has just started the fabrication of a first batch of 4K NMOS static memories (type 2114), using Eurotechnique technology to check the installations. This shop makes it possible to simulate a complete production line for circuits designed by CNET researchers (alone or in collaboration with industry) so as to be able to transfer to industry a tested fabrication process and a reliable product with a "credible" technology; the check-out of this shop should continue until the end of the year.

We should remember that the objective of CNS is to recover our country's technologic lag by 1985, and to evolve from there toward original micron and submicron technologies using the necessary CAO and fabrication means (for which an ion masker is being studied, among other things); 1984 should see the inception of an 0.8 to 1 micron line, for which fundamental research has already begun.

Within its goals, by the end of 1983, CNS should have a CMOS technology with 1.5 micron lines, ready to be used in industry (in particular, it should be in production in 1984 at MHS and Eurotechnique, two of the privileged partners of CNS). To this end, particular efforts are made on the possibility of using the symbolic implantation method MD-MOS (multi-drain MOS) in CMOS.

In parallel, the microelectronics center at CNET is pursuing research on materials and technologies that are indispensable for perfecting new fabrication methods. Among other things, it is also studying new structures for three-dimensional integration (a good example is the stacked-transistor CMOS inverter, presented at ESSDERC last September, which uses an NMOS technology with two levels of polycrystalline silicon, laser annealing, and selective implantation), recrystallization, and material formation with energy beams.

Beyond this program, CNS is now envisaging new research orientations, notably for solid-state imaging devices (the beginning of next year will see the start of silicon MOS sensors, whose internal preproduction is planned for mid-1983), and for speech synthesis analysis circuits (the logic simulation on a PDP-11, of a circuit which will recognize 50 words, operating on phonemes, is under study). And finally, depending on the limits of integration and the evolution of technologies, programs could eventually also be oriented toward materials other than silicon.

Digital COFIDEC Under Study

But in order to achieve these objectives, it is not enough to have the will: one also needs the means, and the future of CNS could depend strongly on whether or not a second stage of projects will be undertaken, whose cost should be equal to that of the first (19 MF), initially planned for 1982 (its simple delay could even cancel the effort made to close the gap). CNS also depends greatly on the allocated operating resources, and at present, if all the investment and hiring programs are fulfilled, the operating budget is far from the announced 40 MF.

Among the circuits that have been designed or are being designed in Grenoble, there is a digital COFIDEC which will be initially be built by Efcis out of NMOS devices; a memory coding circuit, also NMOS, and also made by Efcis (these two circuits use MD-MOS technology); an 8-bit CMOS microcomputer for the T83 which will be built by MHS in mid-1982; and an XMOS MODEM signal treatment device which should be built by Eurotechnique in 1983. CNS is also working on an 8 Mbit/s communicator for mixed speech and data information, in collaboration with Renault. This circuit will be built in the pilot shop with 3.5 micron IMOS technology.

CNS has also perfected an integrated CAO system with MD-MOS input language, the CASSIOPEE, whose elementary version is operational.

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CSO: 3102/52

FOUR-LAYER 'MULTICARD' CIRCUIT DEVELOPED BY ICL

Paris ELECTRONIQUE ACTUALITES in French 6 Nov 81 p 13

For the development of rapid logic, ICL Logic-Layer, a subsidiary of the English company ICL, has perfected a four-layer printed circuit board called the Multiboard; the fabrication of an electric circuit on the outer layers of this board requires only a scalpel to remove the conductors that are not used, and soldered wires to make intermediate connections. This board has a quasi constant conductor impedance of about 50 ohms, making it operable at frequencies higher than 50 MHz, which are not at all possible with circuits that use wrapped connections, for instance. Moreover, ICL estimates that manufacturing lead times would then only be less than two weeks.

XY Conductors

The dimensions of the Multiboard are those of the European double card: 233 x 160 mm.

The board has four layers, the two inner ones being used for two supply channels and for the bulk of the assembly. The two outer ones are laid out in X and Y directions, and the circuit is provided with holes every 2.54 mm. According to company spokesmen, it is possible to mount up to 40 integrated circuits, or 650 integrated circuit pins, on the board.

Some of the holes are metallized at specific locations to provide connections between the supply layers and the inner bulk.

Bridging of the conductors by the user changes the characteristic impedance by only 0.5 ohms.

The X-Y structure could make it possible to develop circuits with busses on the first layer and with connections to these busses on the second outer layer. The application of this type of interconnection requires a layout which shows the connections to be made to components, as well as trims and cuts. Currently made by hand, these operations could eventually be performed by automatic machinery.

This product, which is not yet sold in France, would cost about $315 each. European sales should begin in a few months, not through company branches (ICL France, for instance) but through special sales teams.

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TWO-MW NASUDDEN WIND TURBINE TO OPERATE BY MARCH 1982

Stockholm NY TEKNIK in Swedish 15 Oct 81 pp 20-21

[Article by Mikael Holmstrom]

[Text] In 6 months--in March 1982--one of the world's largest wind power plants will be constructed at Nasudden on Gotland.

The wind power plant was ordered by state wind researchers and it will be delivered to the State Power Board by Kamewa in Kristinehamn.

Housed in a modest building near Kamewa's workshops is the project leadership of the Nasudden wind power plant. Here engineers have had to deal with a number of unfamiliar problems. After all, what is being produced on the workshop floor is a prototype. It is also Kamewa's first attempt to break into new markets.

Not much of the work in Kristinehamn has been made public since Kamewa received the bid for the wind power plant after tough competition.

At that time, 1978, Kamewa defeated its competitor Swedewind (Saab-Scania and Stal-Laval) for the right to produce the second of two prototype power plants.

The first wind power plant that the Energy Production Research Board purchased at that time will be erected in December in Maglarp, Scania. (That power plant was presented in NY TEKNIK, 1980:44).

Now, in 1981, the Nasudden power plant's 70 m tower has been completed on Gotland. The heavy components that must be mounted on the tower are under construction in the workshops.

The Nasudden plant will be the third largest wind power plant in the world (based on turbine diameter, 75 m). It is being built by a company with no previous experience in the field:

"The amount of new technology in this project is considerable. The most

difficult part of the design work has been that there are no models, no ready solutions," project leader and civil engineer Ove Hermansson said.

"Our method of solving these problems has been to use known technology for materials and systems. We have been deliberately conservative in our approach."

"Either this power plant will be the end of our involvement or perhaps it will have undreamt-of consequences. The market could become so large that we could produce a dozen or so power plants annually in Sweden alone," Ove Hermansson continued.

More Wind Power Plants

Kamewa, along with Svenska Varv, the manufacturer of the other prototype, is doing its best to see that the industry minister, the State Power Board, and Sydkraft become interested in more wind power plants. Of course, this is assuming that the prototypes function properly.

What problems might arise when the power plant begins test operations in June 1982?

"It is always difficult to make a prototype operate. What we might fear is a problem with the control system," Ove Hermansson answered.

When the first preliminary studies were made in 1975, the company believed it could manage the construction alone, including the aerodynamics and the turbine design and construction. This was not the case, however.

The project leaders in Kristinehamn--around 10 people--have their counterpart in Bremen, West Germany. Approximately the same number of people are working on the aerodynamics at Erno, a subsidiary of the gigantic VFW aviation company.

How "Swedish" is Kamewa's power plant?

"We are responsible for the system. We are also responsible for designing and producing the control system. We are doing most of the engineering work."

"If our project is compared with Svenska Varv's cooperation with Hamilton Standard in the United States, I believe we have a better grip. We are totally dominant--the Germans do as we tell them," Ove Hermansson said.

Erno in Germany previously had a wind power program of its own. Kamewa seems to believe that present expertise in West Germany should also be utilized if more power plants are built.

The first turbine blade is now finished in West Germany. It is now undergoing rotation tests. The steel structure of the second blade is now being welded and the blades, encased in plastic, will be transported to Gotland in March 1982. The same timetable holds for the remaining parts.

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CSO: 3102/72

BRIEFS

SEVEN PROJECTS FOR COMES--The Solar Energy Commission (COMES) has decided to support seven demonstration projects of particular interest. They are: (a) The installation at Porquerolles, of a gas generator which will use the island's forest resources and supply electricity and heat to the Porquerolles Botanical Conservatory. The wood, as well as straw, reeds, and household wastes, will be actually burned on the spot, recovered, dried, and formed into platelets; these will be burned in a gas generator with a thermal power of 400 kw. The gases will be washed and filtered, and a gas/air-powered motor-generator set will produce electricity, while heat will be recovered from the engine cooling circuit. This type of installation satisfies very well the aim of the botanical conservatory, which is to build a number of experimental and promotional systems as examples for the management of the Mediterranean natural environment. COMES will provide 37.5 percent of the financing for this project. (b) The completion of six French photovoltaic projects, jointly financed by COMES and EEC. The objectives of these pilot projects are the research and development of photovoltaic power plant systems in the range of 30 to 300 peak-KW, as well as small scale experiments on new systems. Among these six projects are: the placement of two 5 KW plants at the site of the Eurelios plant in Adrano (Sicily); a 50 KW plant at the location of the Nice Cote d'Azur international airport (to supply electric power to the airport's auxilliary equipment); a 50 KW plant at the Aghia Roumeli site in Crete; a 50 KW plant at Montbouquet (Herault); and a 44 KW plant at the Rondolinu site at Cargese (Haute-Corse). The last four installations are based on single-crystal silicon technology. [Text] [Paris SEMAINE DE L'ENERGIE in French 12 Oct 81 p 11] 11,023

SOLAR PONDS IN PORTUGAL--Lisbon--On September 27 CORREIO DA MANHA announced that in April 1982, Portugal will have the first European "solar lake," whose energy will be used to heat greenhouses belonging to the Ministry of Agriculture in Porto Alto (at 30 km from Lisbon). Using the salinity difference in the waters of an artificial lake, the water in the solar lake, whose construction will begin in mid-October, will have a minimum temperature of 35 degrees C in February, and a maximum temperature of 85 degrees C in August. With an area of 1200 square meters and a depth of 3.5 meters, the lake will be filled with salt-saturated water at the bottom and sweet water at the top. According to the two authors of the project, Karl Nielsen and Ari Rabl, technologists from American universities, who are quoted by the newspaper, the salinity difference will permit a heat accumulation. The paper also indicates that while this technique has already been used in the United States and Israel, it is unprecedented in Europe as far as commercial utilization is concerned, although it is being used experimentally in France. [Text] [Paris AFP SCIENCES in French 1 Oct 81 p 29] 11,023

WIND, PHOTOVOLTAIC POWER COMBINED--Paris--Coupling between an Aerowatt wind generator and a Sophocle photovoltaic heliostat with concentrator, was achieved by Aerospatiale as general contractor, on 25 September at the Turbie site of the CNET (National Center for Telecommunications Studies). This is the first instance of a successful joint utilization of local wind resources, and of photovoltaic energy with sun tracking. The complementary nature of these two forms of energy is particularly interesting in the islands of the Aegean or in the Antilles. In achieving this combination for the first time, in cooperation with CNET and Soterem, Aerospatiale has shown its interest in applying the technologic knowledge it has developed in its Helicopter and Balistics divisions, to the field of renewable energy resources. [Text] [Paris AFP SCIENCES in French 1 Oct 81 p 30] 11,023

CSO: 3102/53

INDUSTRIAL TECHNOLOGY

SWEDISH RESEARCHERS STUDY MANUFACTURE OF MATERIALS IN SPACE

Stockholm NY TEKNIK in Swedish 22 Oct 81 pp 8, 10, 12-13

[Articles by Jan Melin and Reidar Carlsson]

[Excerpts] On the night of 1 October the Swedish Pirat research rocket was launched from the Esrange rocket base outside Kiruna. During the flight, metal foam was produced in a completely new manner. Another experiment conducted during the period of weightlessness will provide cheaper semiconducting materials in the future.

Metal foam is a new substance that may be of great significance as a construction material. It consists of metal that contains many small gas bubbles.

Swedish researchers have now conducted successful experiments on producing metal foam in space. These experiments may provide information on how the foam could be manufactured on earth.

Metal foam was produced in the rocket in one of the experiments. Samples of various aluminum alloys were melted while the rocket was in a weightless state. During the melting process the samples were "fluffed up" to a foam-like material.

The samples consist of aluminum and aluminum alloyed with iron and titanium. They are produced at the Institute of Metal Casting at the Technical University of Stockholm by Prof Hasse Fredriksson and research assistant Hamid Shahani.

The samples, with a volume of 2 cm^3 each, were melted in a crucible saturated with hydrogen gas under high pressure. When the samples have been melted, the hydrogen gas is dissolved in the molten metal. When the samples have solidified, also under pressure, they contain compressed hydrogen gas dissolved in the metal.

When such a hydrogen-saturated sample is then melted under normal atmospheric or lower pressure, the hydrogen is released and the metal is fluffed up. Because of the earth's force of gravity, however, the sample collapses and

the result is not metal foam, but a more slag-like product.

When the samples were melted under weightless conditions in the Pirat rocket, however, they retained their foam-like state even after solidification.

Pore Formation in Metal

Hasse Fredriksson said:

"These experiments are on the basic research level. It is difficult to say how metal foam could be utilized before we have analyzed its strength and other characteristics. One possible use is as a shock absorbing material of high quality."

"Most importantly, however, we can now study pore formation in metal. We know practically nothing about that, since experiments cannot be conducted on earth under the influence of gravity. Once we have discovered how pore formation occurs, we may be able to develop techniques for producing metal foam on earth as well."

The materials research unit used in the experiments consists of a cylinder that is 37 cm high with a diameter of 43 cm. It was constructed by Rolf Jonsson and Sven Wallin of the Rymdbolaget.

The unit contains 12 cylinders of three different types. These have various furnaces used in the materials research experiments. Four of the cylinders containing three furnaces each are used in the metal foam experiments. Thus, a total of 12 metal foam experiments may be conducted during one rocket flight. A power supply battery pack is located at the base of the unit.

Weightless Condition

The entire unit is divided into two equal parts with separate electrical systems. This is so that half the experiments will be successful even if a short should occur in one part. The unit also contains various measurement and control systems. These are contained on plug-in printed circuit cards. In this way, different circuit cards may be plugged in for other experiments.

The entire flight of the rocket took 15 minutes. The rocket was virtually in a weightless condition for 6 minutes. When weightlessness was achieved, the experiment started automatically.

Each sample contained a filament from an ordinary photographic lamp of 400 W each. In about 15 seconds the samples were melted and the metal foam formed. The entire cylinder was first evacuated and then filled with argon gas so that the filament from the photographic lamp would not oxidize and burn up. During the experiment the temperature was measured by a thermocouple in the sample and another indicator registered the pressure. These

values were registered on earth and they will now be evaluated.

"Even now, however, we can say that the experiment went well," Prof Hasse Fredriksson said.

Three Times More Usable Semiconductors

Today up to 75 percent of the semiconductor crystals manufactured must be discarded. This is because of our poor knowledge of how metals and other substances blend together.

Swedish researchers now believe that 75 percent of the crystals could be utilized, instead. This was concluded after successful materials research experiments onboard the Pirat rocket.

Tore Persson and engineer Lars Lindstrom of the Chalmers Institute in Goteborg have constructed a measuring device for determining diffusion coefficients in molten metals.

"These coefficients are practically impossible to determine correctly on earth due to the force of gravity," Tore Persson said.

"With my experiment, I hope to measure what effect gravity actually has. Once this effect is known, it may be taken into account and, in this way, measuring equipment may be calibrated for experiments on earth."

"After studying the literature, I have concluded that the diffusion coefficient is determined falsely for many materials."

"For example, I have investigated the diffusion coefficient for gold in liquid sodium. Simply by tilting the test equipment, I found a diffusion coefficient that was 120 times greater than the figure provided by other measurements."

The great discrepancies in the measured values result from the fact that the effect of gravity on the measurements is unknown. The diffusion coefficient indicates how two substances blend together or diffuse in each other. In the production of semiconducting crystals, for example, gallium diffuses in germanium.

Since the exact value of this diffusion coefficient is unknown, we do not know how a substance that has blended with another substance will solidify. It is unknown which solidification rate is best or which temperature yields the best results.

Because of this, 50 to 75 percent of all semiconducting crystals manufactured must be discarded, since there is an uneven distribution of the impurity.

"I am convinced that in the future a maximum of 10 percent will be discarded, when the diffusion coefficients and solidification process are known," Tore Persson said.

Facts on Research in Space

One branch of research that in recent years has begun using space for its experiments is materials science. Swedish materials researchers have also begun to utilize weightlessness in space for experiments that are impossible on earth.

In space experiments it is possible to avoid the problems that often arise when a molten material is allowed to solidify on earth. On earth the force of gravity causes streams of material in the sample, so-called convection. Convection occurs primarily because various substances in a melt have different densities.

When the disturbing effects of convection are reduced more knowledge will be gained of production processes for various materials and, therefore, about the material itself.

Swedish research has traditionally enjoyed a strong international position in the field of materials science. In order not to lose ground in the future, Swedish researchers have now begun materials research in space. The Swedish Pirat rocket, which was launched from Esrange near Kiruna, is an example of that and space has already been booked for Swedish materials research experiments on one of the first American space shuttles.

The areas of materials science the Swedish researchers are interested in primarily are eutectic structures, dendritic growth, miscibility gaps, and diffusion in molten metals.

When melts of pure metals are mixed an alloy is formed. For many mixtures a certain proportion of the metals has a lower melting point than all other proportions of the metals included in the alloy. If the melt is alloyed to solidify from this temperature, the alloy assumes a special geometric structure. This is called the eutectic structure. On earth, convection creates disturbances in this structure, however. These faults reduce the resistance of the metals to stresses across the laminae.

Dendritic Growth

When certain alloys solidify, solid metal crystals are formed through so-called dendritic growth. The dendrites are solidified, tree-like outgrowths in the molten metal. The word "dendrite" comes from the Greek, meaning tree. Materials researchers assume on theoretical grounds that these outgrowths have different forms if the metal solidifies under weightless conditions or on the earth. Convection also causes outgrowths to break,

which reduces the strength and workability of the alloy.

Miscibility Gaps

Not all metals can be mixed with one another if the temperature is below a certain limit. Below this temperature, convection will occur on the earth's surface and the metals will separate into layers. This layer formation cannot occur under weightless conditions. If a melt that has solidified under weightless conditions retains its miscibility, then a completely new material has been produced. Such materials may possess useful characteristics such as increased strength.

Researchers need to know various types of transport properties in metals used in an experiment. Examples of such properties are the rate of diffusion and the thermal conductivity. Researchers must know how these properties appear in the weightless state in order to evaluate other experiments conducted in space. The measurements must be made under the same conditions as those used in the experiments, i. e. under weightless conditions.

Another advantage of conducting experiments under weightless conditions is that the experiment can be conducted without having the experimental material in contact with any container or anything else that could contaminate the sample. Thus, researchers believe that crystals could be produced that are much purer than those previously produced.

Thus, fields of application for products produced under weightless conditions can already be discerned. Production under weightless conditions is not necessary, however, for materials research in space to be important. Researchers believe that experiments under weightless conditions will provide valuable information for materials production on earth.

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CSO: 3102/74

FRANCE, FRG COOPERATE ON HIGH-SPEED GROUND TRANSPORTATION

Paris ELECTRONIQUE ACTUALITES in French 6 Nov 81 pp 1,8

[Article by J.-P. Feste]

[Text] Grenoble--On 29 October, test installations were inaugurated for a linear railway traction motor of the Institute for Transportation Research, in the presence of a representative of the Ministry of Transportation, and of a delegation from the FRG Ministry for Research and Technology (BMFT).

It is in fact as part of a French-German cooperation, that tests will be started in 1982, on linear traction motors for a prototype engine capable of reaching 100 km/h.

These tests themselves are part of studies for a contactless means of transportation capable of functioning at 300 to 400 km/h in some 15 years.

The cooperation agreement between France and Germany on the year's means of transportation, signed in 1978, is thus now entering a concrete test phase for a linear motor (invented by the Saint-Etienne engineer Guimbal). These tests should allow subsequent realistic technical-economic comparisons between several high-speed transportation systems.

The "propulsion-guidance module" for the motor of a magnetic suspension vehicle developed by the German company Thyssen-Henschel will be certified during 1982. It consists of an U-shaped linear induction motor and of its control oscillator (studied by CEM), developed by the Saint-Etienne company Celduc with support from ANVAR; as well as of an electromagnetic guidance system, developed by Thyssen-Henschel with the support of BMFT.

Difficulty: Electronic Control

The construction of such an on-board propulsion-guidance module is encountering difficulties in the perfection of the control electronics of the actual motor and of the suspension device. Prototypes of the electronics of the latter device have however been built. They consist of a transistor chopper working at 100 kHz. This chopper switches 440 volts at 40 amperes by means of four BUX 98 transistors in constant operation. It is protected against output short circuits. The fact that its efficiency is greater than 99 percent is explained by the use of lossless ancillary switching circuits, whereas the traditional circuits use resistors and capacitors which consume power. This chopper has been built by Thyssen-Henschel.

The oscillator for control of the linear motor is being studied by the CEM company, and will be built by Fintronic. This oscillator, whose frequency will have to be variable, will use power thyristors, because transistors for the voltages and currents required by the linear motor are not usable. A power of 3 MW must be developed to propel a vehicle at nearly 300 km/h.

The choice of a linear motor is not yet final. Research is being carried out in two directions: in Germany, the option is a long-stator motor; in this case, the track is a coil and the vehicle carries only a passive "rotor," avoiding electric transmission from the track to the vehicle.

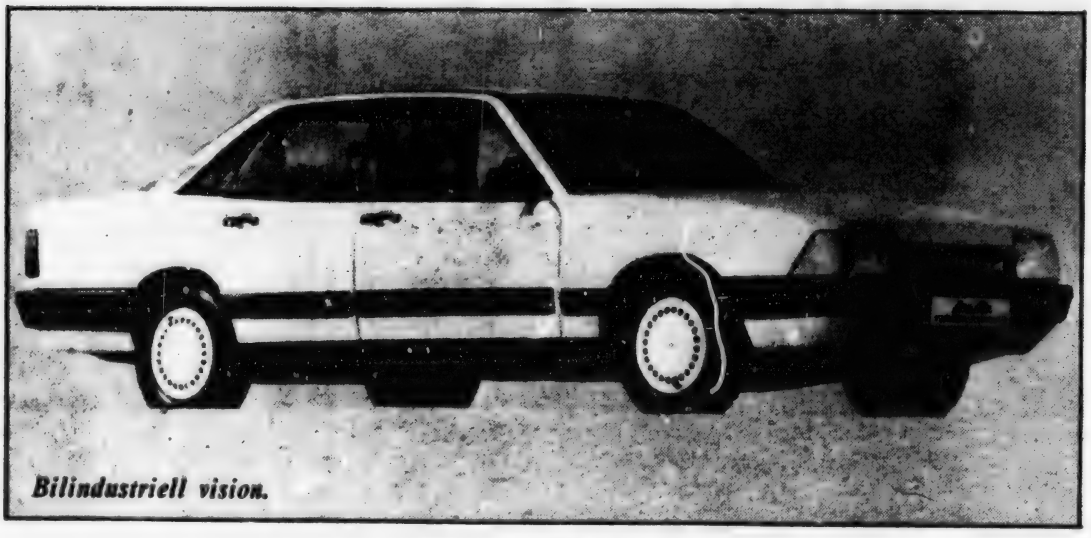
On the French side, the studies are focused on a one-piece short stator in the vehicle, and a U-shaped rail. It would appear that the solution being pursued would have the German electromagnetic suspension system, and the French U-shaped propulsion system.

11,023
CSO:3102/54

AUDI'S VISION OF CAR OF FUTURE PRESENTED

Stockholm NY TEKNIK in Swedish 8 Oct 81 p 14

[Text] Audi has now presented its vision of the car of the future. The car is similar to the Audi 100, but the air resistance has been reduced to c_w = 0.288! Unlike many other test cars in the West German Auto 2000 project, Audi has chosen to retain the gasoline engine. The cylinder volume is only 1.6 liters. The turbocharger and the knock detector contribute to the high power--110 hp (81 kW). Both a turbocharger and a knock detector are found on this year's models of the Saab Turbo.



Auto industry's vision

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BRITISH MAGNETIC LEVITATION LINE OPEN TO PUBLIC BY 1984

Bern TECHNISCHE RUNDSCHAU in German 20 Oct 81 p 53

[Text] The experimental vehicle in Figure 3 hovers on a magnetic field, guided by a single concrete rail. It is the prototype of a commuter vehicle which will link the new airport terminal in Birmingham with the railroad station and the National Exhibition Centre by 1984. The carriage hovers 15 mm above the guiderail. This distance does not change, even if the load increases or shifts. Control mechanisms respond to changes of this kind and adjust the energy supply to effect the necessary compensation. The magnetic levitation system known as "Maglev" provides smooth, noiseless travel without exhaust gases. The linear induction motor underneath the vehicle creates a magnetic field between it and the guiderail, raising the vehicle and propelling it. The prototype vehicle is currently being tested by research and development engineers of British Rail to determine how it reacts in sharp curves and on gradients.

The commuter transportation planned for Birmingham will consist of three vehicles, each of which has room for 30 seated and 48 standing passengers. The cars have no driver, and the service will require only two or three men to run. Cable television supervision will ensure safety of operation. Passengers will be able to summon the cars by pressing a button at the stations. The trip will take 90 seconds from end to end, at a speed of 36 kms/hour.

Fig. 3. Experimental vehicle for the magnetic levitation railroad in Birmingham.

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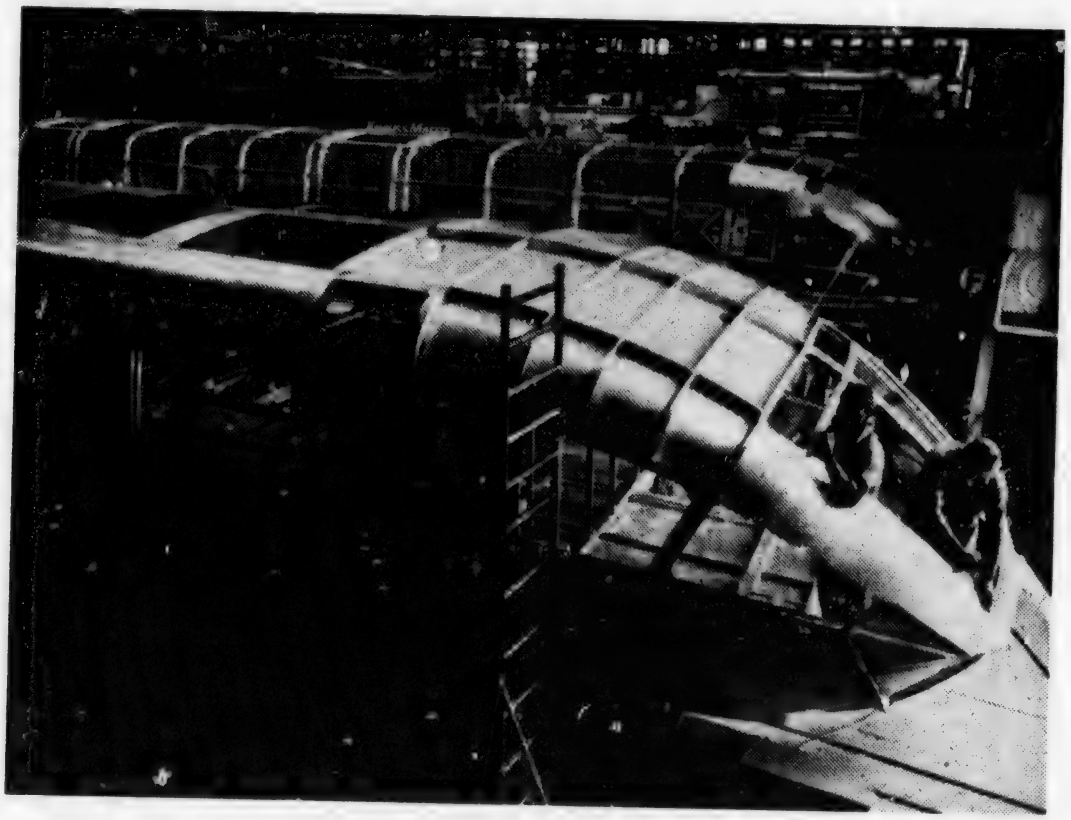
WORK CONTINUES ON MAGNETIC LEVITATION VEHICLE

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 11 Nov 81 p 5

[Text]



Intensive work is continuing on the magnetic levitation railroad: While the test track in Emsland is under construction, Krauss-Maffei, one of the companies in the MBB [Messerschmitt-Bolkow-Bloehm] consortium, is building the double-section magnetic levitation vehicle 06. MBB reports that the vehicle is of sandwich construction in which prefabricated sandwich plates are bonded and riveted into a "skeleton" of double-T sections. The magnetic propulsion and guidance system--the "heart" of a magnetic railroad--was developed at MBB in Ottobrunn. In a magnetic railroad the levitation truck assumes the function of a swivelling truck. MBB says that the eight levitation trucks will be thoroughly tested before they are attached to the body.

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FIRST FLIGHT OF 'SKYSHIP 500' DIRIGIBLE SUCCESSFUL

Paris AFP SCIENCES in French 1 Oct 81 p 47

[Text] London--The new dirigible Skyship-500, with which the British company Airship Industries hopes to reinstate this means of transportation, has successfully performed its maiden flight on 28 September, leaving from the Cardington air base in the center of England.

It is a non-rigid airship, whose helium-filled shell was manufactured by the French company Aerazur, a subsidiary of the Zodiac group. Powered by two Porsche car engines, each connected to a propeller which will give it a cruising speed of 62 knots (nearly 115 km/h), it is designed for a payload of two tons, which means about ten passengers in addition to the crew.

A spokesman for Airship Industries has indicated that during this two-hour maiden flight, the craft reached an altitude of some 420 meters, and a speed of 44 knots.

Airship Industries hopes to obtain a navigability certificate for passenger transportation within one year, and by the end of this year for commercial flights without passengers. Equipped with a pressurized cabin, it could be used for sea surveillance, and for the electronic surveillance of borders, territories, fisheries, and so on.

The builders are already preparing several larger versions, one of which, capable of lifting 10 tons, will enable them to respond to an offer for bids issued by the United States Cost Guard, who wants to obtain airships for maritime patrols. Another version, the Skyship-600, whose maiden flight is planned for mid-1982, could lift nearly three tons, or some twenty passengers.

The construction of the Skyship-500 has cost 1.5 million pounds.

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BMW INSTITUTES NEW CONCEPT TO OPTIMIZE PRODUCTION METHODS

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 16 Nov 81 p 7

[Article by Joh-Chr Spira: "BMW Plans To Optimize Manufacturing Technology in a Pilot Plant"]

[Text] Frankfurt, 15 Nov--Of course the famous Monday car does not exist in reality. But in order that no manufacturing problems occur during the difficult phase at the start of production of new car models, nothing can be left to chance. The preparations for the start of production have to be particularly perfect with those makes of car whose product philosophy is a claim to high quality. Dr Wolfgang Reitzle, head of the pilot plant and methods technology at BMW, had made a long and thorough study of the periphery of cause and effect during production start-up of earlier BMW models. He suggested a solution: "We need a pilot plant, a mini-automobile factory, in which we can build the first prototypes months before the start of production, in which we can be become familiar with the new cars as early as possible and recognize the fundamental manufacturing problems."

Reitzle understands an automobile product philosophy claiming a "high level of quality" to mean above-average quality in construction and manufacture. Besides a product designed for ease of manufacture, he includes in construction quality the dimensions and choice of materials to meet high sustained loads, as well as advanced technical solutions in chassis and engine design to provide comfort and above-average performance, while retaining controllability in critical driving situations. Controllable manufacturing quality in the factory finally extends to the quality of the bought-in parts and depends on precise quantities and suitable quality control checks at the time of delivery.

Other automobile manufacturers have pilot plants. But BMW has quite consciously developed a new concept. At BMW they are convinced that it is not only effective in advancing the deadline for start of production considerably, but it can also reach the quality level required for production in the shortest time. The pilot plant was dedicated with the new 5-series. The result has clearly surpassed all expectations. Reitzle says: "It was not only the best start of production in the history of BMW, but practically a few months after the start of production,

according to internal quality systems (audit-check), we attained and sustained the quality number that we had after several years during the best times of the 5-series, although we were not at full production volume. This made it possible to reach full production much sooner than planned."

The workers in the pilot plant familiarize themselves with the new car much sooner than usual, in fact, 2 years before the start of production. They build prototypes and try to discover all the basic manufacturing problems. One year before the start of production, when the car came to the pilot plant in its actual form, it had already reached a much higher state of technical readiness for manufacture, that is, it was more ready for the production line and easier to assemble. Four AV (work preparation) vehicles were built in this way. At this stage it was possible to identify about one-half of all the manufacturing problems which had to be solved later on the line. As a result, most of them could be taken into account when tools and means of production were being considered. To prepare the plant, workers in the pilot plant were trained on the line in the manufacture of the previous model. They became familiar with manufacturing problems and, from the start, were able to ensure that certain problems did not occur only when the new model came out. Conversely, 2 years earlier, the most important manufacturing people from production, experienced master craftsmen and workers, came to the pilot plant to introduce manufacturing knowhow in pilot production.

The methods technology office adjoins the pilot plant, with its own workshop which can carry the necessary changes on any part at short notice. Consequently, an extremely flexible group of workers is needed who can work more or less on call and not have to wait for a drawing. Twelve months before the start of production--formerly 0-series, now functional assembly--60 percent of all the parts must be available and be able to be assembled using tools. So the parts that are now put together are no longer hand-made but come from finished machinery. They amount to several hundred parts selected to check accuracy of fit and corresponding to later production status. The pilot plant workers can maintain a constant review of the exact state of development of the parts, with the assistance of a small data processing unit.

The establishment of the new pilot plant means more than just preparation for the start of production. In contrast to comparable installations, there is the group of specialists in "methods development," besides the group working with the unfinished body and manufacturing assembly. New manufacturing methods are prepared that will be definitive for all BMW factories. This group of specialists tests, for example, all the available robots and the appropriate technology for their use. Other experts are developing new methods of surface technology, such as powdered paint technology, which will soon become a new area of specialization.

In a very early phase of a project, the development office is given expert advice by production planning. If a new model is being assembled, the corrosion protection specialists and the welding and bonding specialists are on hand and render their opinion of what development has thought up. There may be a suggestion as to how robot welding can be employed and optimized. Or it may turn out that a small change in construction can eliminate a critical source of corrosion in a flange.

By confronting experts who have this type of knowledge and experience with the new car, their fertile ideas can be used before the new model goes into production. BMW considers this paralleling of methods development and pilot plant to be an important new area of specialization. With a small team, the greatest possible effect for safety in volume production is achieved.

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NETHERLANDS, BELGIUM, FRANCE BUILD POLYESTER MINESWEEPERS

Amsterdam ELSEVIER MAGAZINE in Dutch 14 Nov 81 pp 134, 135, 137, 138

[Article by H. J. Looman: The construction of a series of polyester minesweepers by Van der Giessen-De Noord (GN) Shipbuilding in Alblasserdam makes good progress. Starting problems have delayed work, but these are now conquered. The trial run of the first of 15 minesweepers made of fiber and artificial resin is now in sight. Shipyard director J. C. C. Smit speaks of a unique project in many ways, which one can also call a textbook example of industrial innovation]

[Text] This is a unique project, because of the production process in the factory and because of the cooperation of two other countries: France and Belgium. In total it concerns the building of 40 minesweepers, 15 for the Dutch, 15 for the French and 10 for the Belgian Navy. The latter initially planned on ordering 15, but that number was later reduced to 10 with an option on the remaining 5.

Everything hinges on the fact that the navies of the three countries had as an unconditional requirement that the new series of minesweepers--contary to the usual wooden construction--would have to be constructed of fiber reinforced polyester (frp).

To Van der Giessen-De Noord (GN) this building of a series of 15 minesweepers has been a technical challenge of the first order from the beginning. "This is one of the most difficult tasks we have encountered since our yard started in 1962," says Mr J. C. C. Smit. "Polyester is of course a totally different building material from steel or wood. Not only from a technical point of view, but also in a social and organizational point of view. The building materials and the finished product are made in one process, which in shipbuilding is something very particular."

This required a completely new and unconventional approach. A big working hall had to be constructed, 144 m long, 43 m wide and 23 m high. This was necessary because fiber reinforced polyester can only be worked in a steady humidity and a steady temperature. This guarantees a final product that meets the very high quality requirements which are required by the commissioner.

Mr Smit: "We realized immediately that it concerned a production process that would give us a few problems, particularly in the beginning. And those problems presented themselves. You could call them kinks. Through the use of equipment

improvements and refining of the production method we have had that matter firmly in hand since the fall of 1979. At the moment we are working on four ships at the same time in the production hall and the first ship, the 'Alkmaar' is far enough in final building that she can be launched in the first half of next year. Yes, it is more than a year later than we had hoped, but it took time before we had the proper production rhythm. Additionally, during the building of the prototype on the French navy yard in Lorient we had to solve more problems than were expected. That ship will make its trial run this coming December, but this could have occurred at the end of 1979.

The steel mold in which the ship's hull is raised, and which consists of fiberglass and artificial resin layer after layer, was manufactured in our own shipyard. Steel of high quality had to be used, as the mold had to be stiff and inductile. Moreover, the inside had to be polished as smooth as silk. "That was quite a tough job," says yard director Smit, but the mold was finished in 1978 and the keel for the first minesweeper could be layed down.

The production is established such that work can be done on four ships at the same time. The production process in this curious shipping factory consists namely of four phases: (1) the building of the hull in the mold; (2) the placement of the decks and bulkheads; (3) the installment of the main propulsion; (4) the finishing of the ship. Each 5 months the ships move up one position, such that new space becomes available for the next ship each time. This requires an industrial organization which is adjusted very accurately, but this also functions according to smooth management.

In this tremendous pilot hundreds of men and 30 women are working on the polyester hulk, all of the personnel educated in our own company, since the hiring of people who had experience in polyester, was not possible. During the hardening process of polyester small parts of sturene are freed, which need to be kept within the bounds. The labor inspection requires that it cannot be more than 100 particles per million. Smit: "We stay far below that. I may say that our Company has not saved money nor effort in order to reduce to a minimum difficult working conditions such as bad climatological conditions, noise and air pollution. Due to the air treatment installation we are capable of reducing the number of released styrene parts during full production to 25 p.p.m. This is possible through the well thought-out exhaust and ventilation system, which cost us 10 percent of the total investment, which, by the way, we did not mind spending. Throughout the year a constant temperature of 18 degrees Celcius is maintained in the production hall and a constant humidity of 55 percent. Those are working conditions no one can complain about."

Since these plastic ships are not built on a slipway, a different manner of launching became necessary. An "elevator" was chosen, which can lift ships in and out of water up to a weight of 1250 tons. This ship elevator, the first of its kind and designed by the Dutch concern Hydraudyne in Boxtel, is ready for production and was recently put into use amidst festivities.

The cooperative obligation between the French, Belgian, and Dutch navies leans on an equal economic capital brought in by the participating countries. In short, the Dutch industry supplies--for all 40 minesweepers which are under

construction--the main propulsion, the gear wheels, screws and screw shafts. This is a particularly attractive order for Brons-Appingedam, the concern that supplies the special Stork-Werkspoor diesel motors. Rademaker constructs the gear wheels and Lips the screws and screw shafts. Altogether this entire project means employment for more than 7000 Dutch man years, the suppliers included. Each of the three countries build their own polyester hulls. The French industry takes care of the minesweeping and combatting system while the Belgians, who have not yet started building the polyester hulls, take care of the mechanical and technical installation.

These minesweepers--the Royal Navy speaks rather of mine combatting ships--which must perform dangerous work at sea later on, have to meet special requirements: (1) a very low underwater noise; (2) a minimal disruption of the earth magnetic field in the immediate surroundings of the ship; (3) perfect maneuvering possibilities and (4) large shock resistance of all installations in order to be able to resist mine explosions from some distance from the ship.

The big difference between a conventional mine'sweeper' and this advanced mine 'fighter' is that the former more or less does its work blindfolded and whereas the 'fighting' occurs with wide open eyes. During the sweeping a mine which has to be removed by the sweeper hanging at the back of the ship has to be approached magnetically and accoustically. Yet, one has to wait for something to be caught. During the hunt, the mine will be actively searched and localized by the sonar which dispatches sound waves. After that a small, unmanned submarine which propels itself is put overboard. This mini-sub, provided with a television camera, sends pictures to the ship via cable. After identification the mine can be destroyed by means of an explosive. This smart mini-sub is described with the letter-cipher-combination PAP 104. Through active searching of the prey the mini-hunter is in sea territories which lend itself to this, a much more effective tool than a minesweeper.

From this should not be concluded that the Royal Navy does not have hunters at its disposal at this moment. At the time four minesweepers of the Dokkum-class have been rebuilt to hunters at Van der Giessen-De Noord. The experience gained from this certainly contributed to the fact that this shipyard was well prepared for the execution of the present naval order. This order will provide employment for 250 men and women until 1987, when the last and 15th minesweeper will be delivered. And hopefully much longer.

Three-quarters of the minecombatting ships, presently in service in the Western world, are antiquated and therefore, ready for replacement. GN Shipbuilding is, thus, by its nature into the market: "I may say that this shipyard can count itself at this moment among the most modern and best equipped in the world. We aim for a special, high-quality product and those who like to use words such as industrial innovation, can come and look at us. The building of this series of frp ships is a classic example of innovation. We have been busy for years with this, and started thinking about it in the beginning of the 1970's.

"As far as the sale of these minesweepers to foreign navies is concerned, I can only say that several countries have shown their interest. This, however, is not a business of our yard alone. In a sale to third parties the three partners will

act as a unity as well. This does not take away the fact that it would become a good business for us and the supplying industry if orders would increase in the course of the coming years."

Caption on pp 134

Two polyester minesweepers in the third and fourth building phase in the big working hall of the Van der Giessen-De Noord shipyard in Alblasserdam. The polyester, reinforced with fiberglass is so transparent that one can see a workman's footprints, while standing under the ship. A curious experience.

Caption on pp 135

Polyester minesweepers of the Alkmaar-class are rather small ships: 47 m long and 9 m wide, with a draught of only 2,45 m and an average water displacement of 511 tons.

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6 Jan 1982